PROJECT REPORT ON OBSTACLE AVOIDING ROBOT

J.S.S. Academy of Technical Education

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Year: 2nd (3rd SEM)

CERTIFICATE

This is to certify that project on the topic
OBSTACLE AVOIDING ROBOT

That has been successfully completed and submitted by

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(1900910210061)

for the fulfillment of Summer Internship 2020

During the course of the project they have worked sincerely and were good throughout the implementation and presentation of the project undertaken

Dr. Sujatha K.S
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(Mentor)

CONTENTS

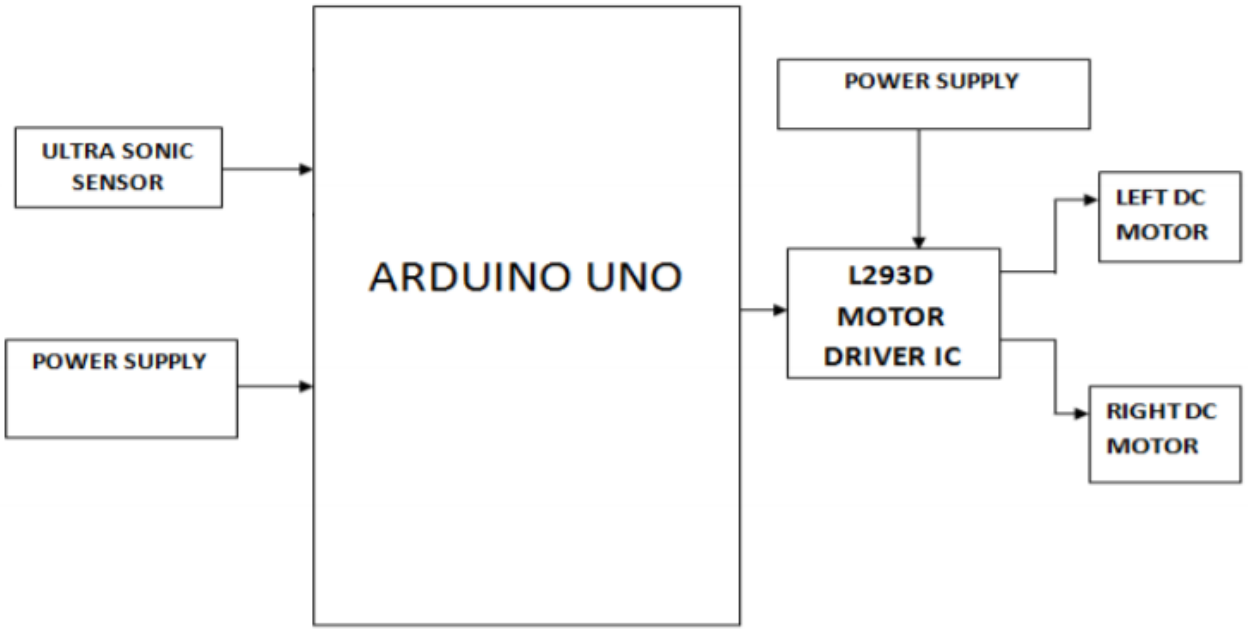
INTRODUCTION:

Robotics is part of Todays communication. In today's world ROBOTICS is fast growing and interesting field. It is simplest way for latest technology modification. Now a days communication is part of advancement of technology, so we decided to work on ROBOTICS field, and design something which will make human life simpler in day today aspect. Thus we are supporting this cause. An obstacle avoiding robot is an intelligent device, which can automatically sense and overcome obstacles on its path. Obstacle Avoidance is a robotic discipline with the objective of moving vehicles on the basis of the sensorial information. The use of these methods front to classic methods (path planning) is a natural alternative when the scenario is dynamic with an unpredictable behaviour. In these cases, the surroundings do not remain invariable, and thus the sensory information is used to detect the changes consequently adapting moving. It will automatically scan the surrounding for further path. This project is basic stage of any automatic robot. This ROBOT has sufficient intelligence to cover the maximum area of provided space. It has a ultrasonic sensor which are used to sense the obstacles coming in between the path of ROBOT. It will move in a particular direction and avoid the obstacle which is coming in its path. We have used two dc motors to give motion to the ROBOT. The construction of the ROBOT circuit is easy and small .The electronics parts used in the ROBOT circuits are easily available and cheap too.

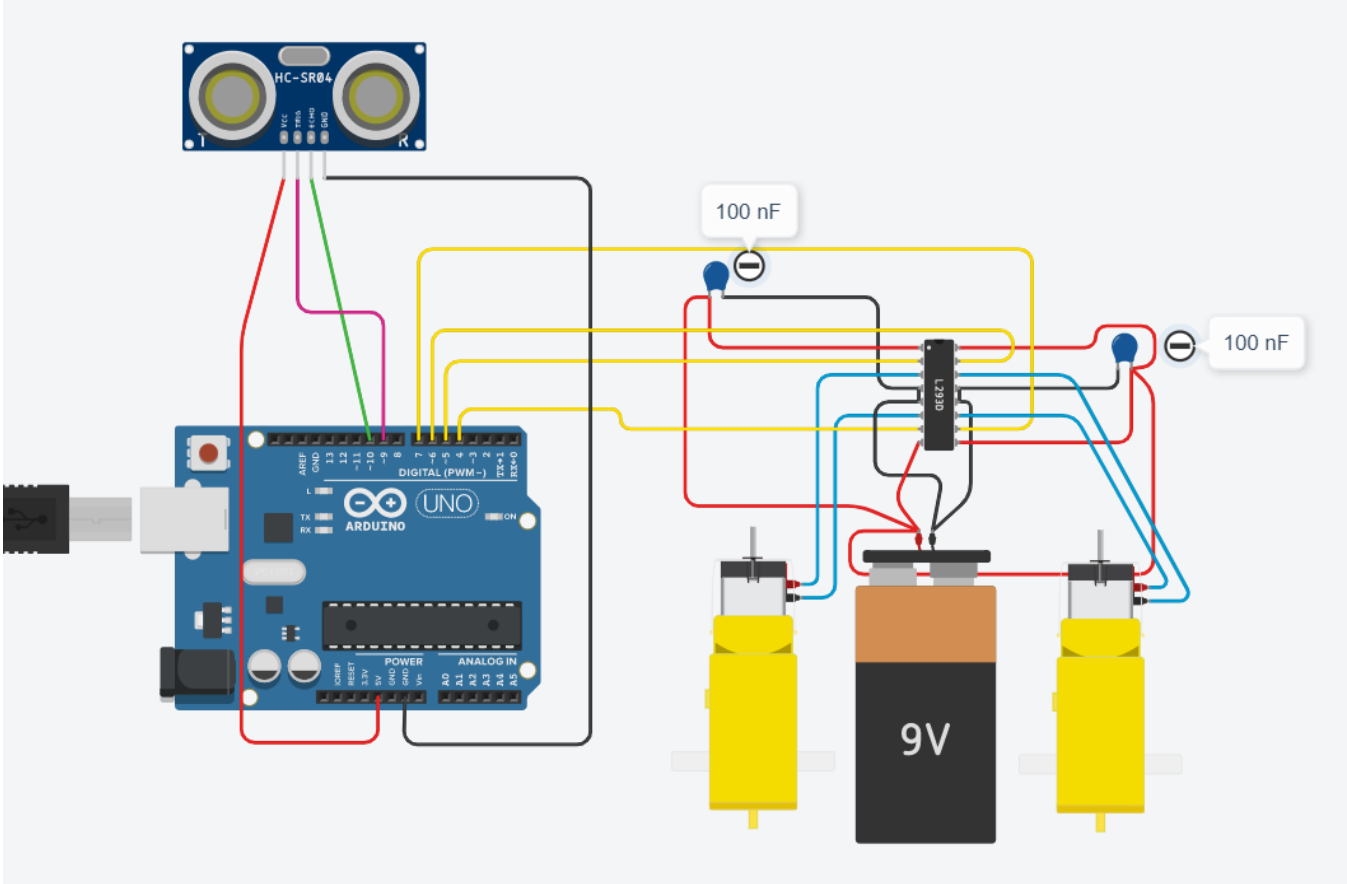
PROJECT OVRVIEW:

- The project is developed with the motive that no external commands are given to the robot.
- All the processing from detecting the object to making turns is done by an Arduino.
- The distance value from the sensor is processed by the Arduino for making decisions.
- According to the command the dc motor are also sent the signal for changing directions if an obstacle is detected.

BLOCK DIAGRAM:



CIRCUIT DIAGRAM:



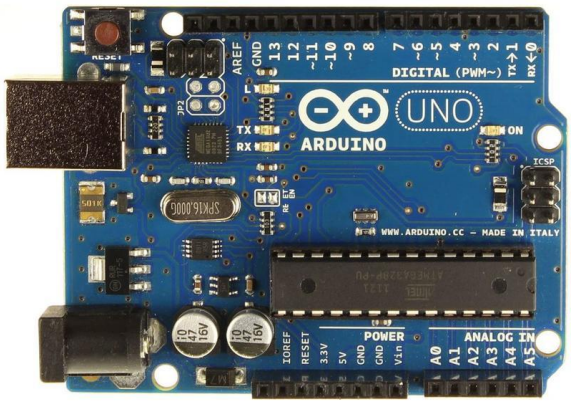
COMPONENTS REQUIRED:

- Arduino uno board
- Ultrasonic sensor
- L293D motor driver IC
- BO motors - 2
- Battery
- Jumper wires

DESCRIPTION OF COMPONENTS:

- AURDUINO UNO -

Arduino Uno is an ATmega 328p Microcontroller based prototyping board. It is an open source electronic prototyping platform that can be used with various sensors and actuators.Arduino Uno has 14 digital I/O pins out of which 6 pins are used in this project.



- Ultrasonic sensor (HC-SR04) -

It is an Ultrasonic Range Finder Sensor. It is a non-contact based distance measurement system and can measure distance of 2cm to 4m.The ultrasonic sensor consists of a multi vibrator, which fixed at its base. The multi vibrator is combination of a resonator and vibrator the ultrasonic waves generated by the vibration are delivers to the resonator. Ultrasonic sensor actually consists of two parts: the emitter which produces a 40 kHz sound wave and detector which detects 40 kHz sound wave and sends electrical signal back to the microcontroller. HC-SR04 ultrasonic sensors are used which consist of 4 pins VCC, Trigger, Echo and GND.

- L293D Motor driver IC -

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors. It consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins.

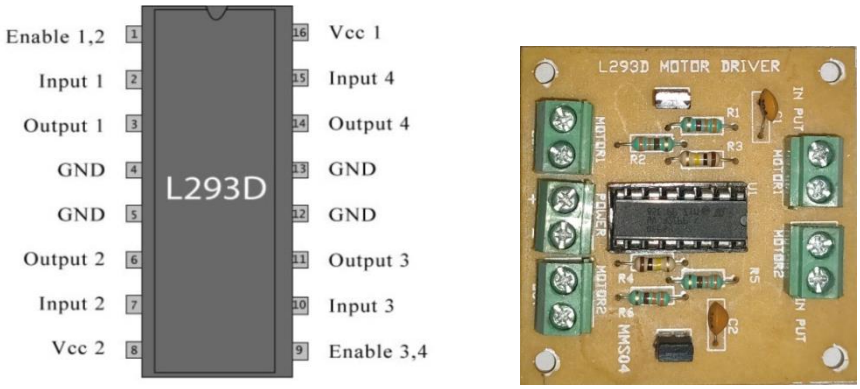


Fig: motor driver and motor driver module

Pin No. - Pin Characteristics:

- 1 - Enable 1-2, when this is HIGH the left part of the IC will work and when it is low the left part won't work.
- 2 - INPUT 1, when this pin is HIGH the current will flow though output 1
- 3 - OUTPUT 1, this pin should be connected to one of the terminal of motor
- 4,5 - GND, ground pins
- 6 - OUTPUT 2, this pin should be connected to one of the terminal of motor
- 7 - INPUT 2, when this pin is HIGH the current will flow though output 2
- 8 - VCC2, this is the voltage which will be supplied to the motor.
- 9 - Enable 3-4, when this is HIGH the right part of the IC will work and when it is low the right part won't work.
- 10 - INPUT 3, when this pin is HIGH the current will flow though output 3
- 11 - OUTPUT 3, this pin should be connected to one of the terminal of motor
- 12,13 - GND, ground pins
- 14 - OUTPUT 4, this pin should be connected to one of the terminal of motor
- 15 - INPUT 4, when this pin is HIGH the current will flow though output 4
- 16 - VCC1, this is the power source to the IC. So, this pin should be supplied with 5 V

- BO Motor -

We have used two BO motors at the rear of the robot. These motors provide more torque than normal motors and can be used for carrying some load as well.

CONNECTION :

Arduino is the main processing unit of the robot. Out of the 14 available digital I/O pins, 7 pins are used in this project design.

The ultrasonic sensor has 4 pins: Vcc, Trig, Echo and Gnd. Vcc and Gnd are connected to the +5v and GND pins of the Arduino. Trig (Trigger) is connected to the 9th pin and Echo is connected to 10th pin of the Arduino UNO respectively.

L293D is a 16 pin IC. Pins 1 and 9 are the enable pins. These pins are connected to +5V. Pins 2 and 7 are control inputs from microcontroller for first motor. They are connected to pins 4 and 5 of Arduino respectively.

Similarly, pins 10 and 15 are control inputs from microcontroller for second motor. They are connected to pins 6 and 7 of Arduino. Pins 4, 5, 12 and 13 of L293D are ground pins and are connected to Gnd.

First motor (consider this as the motor for left wheel) is connected across the pins 3 and 6 of L293D. The second motor, which acts as the right wheel motor, is connected to 11 and 14 pins of L293D.

The 16th pin of L293D is Vcc1. This is connected to +5V. The 8th pins is Vcc2. This is the motor supply voltage. This can be connected anywhere between 4.7V and 36V. In this project, pin 8 if L293D is connected to +5V supply.

WORKING:

Before going to working of the project, it is important to understand how the ultrasonic sensor works. The basic principle behind the working of ultrasonic sensor is as follows:

Using an external trigger signal, the Trig pin on ultrasonic sensor is made logic high for at least 10µs. A sonic burst from the transmitter module is sent. This consists of 8 pulses of 40KHz.

The signals return back after hitting a surface and the receiver detects this signal. The Echo pin is high from the time of sending the signal and receiving it. This time can be converted to distance using appropriate calculations.

The aim of this project is to implement an obstacle avoiding robot using ultrasonic sensor and Arduino. All the connections are made as per the circuit diagram. The working of the project is explained below.

When the robot is powered on, both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculate the distance between the robot and the reflective surface.

This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 9cm, the Robot stops, it backs up a little bit and then activates only the Left Wheel Motor in forward direction (in order to rotate the robot and analyse the area) and the ultrasonic sensor calculates the distance and if it is more than 9cm then the both wheels are activated and the robot moves in forward direction until next obstacle is found, the process continues forever and the robot keeps on moving without hitting any obstacle.

SOURCE CODE:

```
int trigPin = 9;      // trig pin of HC-SR04
int echoPin = 10;     // Echo pin of HC-SR04


int motorLeftPin1 = 4;       //Left motor SW 1
int motorLeftPin2 = 5;       //Left motor SW 2
int motorRightPin1 = 6;    //Right motor SW 3
int motorRightPin2 = 7;    //Right motor  SW 4

long duration, distance;

void setup() {
  delay(random(500,2000));   // delay for random time
  Serial.begin(9600);
  pinMode(motorLeftPin1, OUTPUT);      // set Motor pins as output
  pinMode(motorLeftPin2, OUTPUT);
  pinMode(motorRightPin1, OUTPUT);
  pinMode(motorRightPin2, OUTPUT);


  pinMode(trigPin, OUTPUT);         // set trig pin as output
  pinMode(echoPin, INPUT);          //set echo pin as input to capture
reflected waves
}
```

```
void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);     // send waves for 10 us
  delayMicroseconds(10);
  duration = pulseIn(echoPin, HIGH); // receive reflected waves
  distance = duration*0.034/2;   // convert to distance
  delay(10);
    // If you dont get proper movements of your robot then alter the pin numbers
  if (distance > 10)
  {
    digitalWrite(motorRightPin2, HIGH);  // move forward
    digitalWrite(motorRightPin1, LOW);
    digitalWrite(motorLeftPin2, HIGH);
    digitalWrite(motorLeftPin1, LOW);
  }


  if (distance < 9)
  {
    digitalWrite(motorRightPin2, LOW);  //Stop
```

```
    digitalWrite(motorRightPin1, LOW);
    digitalWrite(motorLeftPin2, LOW);
    digitalWrite(motorLeftPin1, LOW);
    delay(500);
    digitalWrite(motorRightPin2, LOW);  //movebackword
    digitalWrite(motorRightPin1, HIGH);
    digitalWrite(motorLeftPin2, LOW);
    digitalWrite(motorLeftPin1, HIGH);
    delay(500);
    digitalWrite(motorRightPin2, LOW);  //Stop
    digitalWrite(motorRightPin1, LOW);
    digitalWrite(motorLeftPin2, LOW);
    digitalWrite(motorLeftPin1, LOW);
    delay(100);
    digitalWrite(motorRightPin2, HIGH);  //left turn
    digitalWrite(motorRightPin1, LOW);
    digitalWrite(motorLeftPin1, LOW);
    digitalWrite(motorLeftPin2, LOW);
    delay(500);
  }
}
```

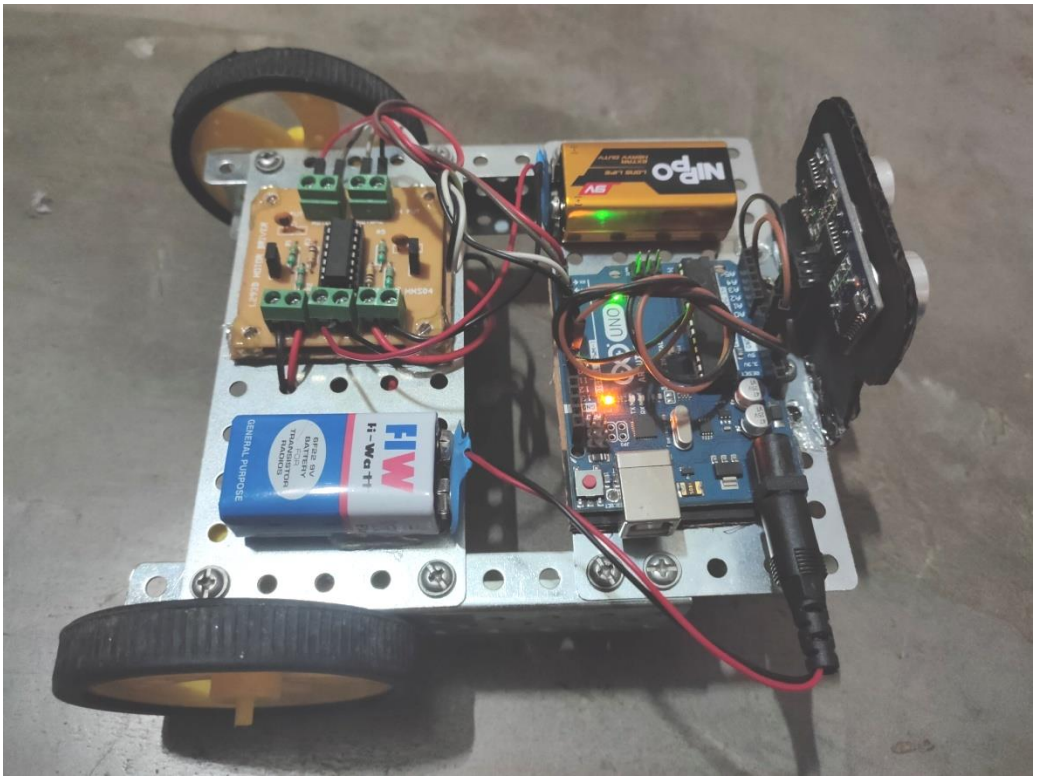
APPLICATIONS:

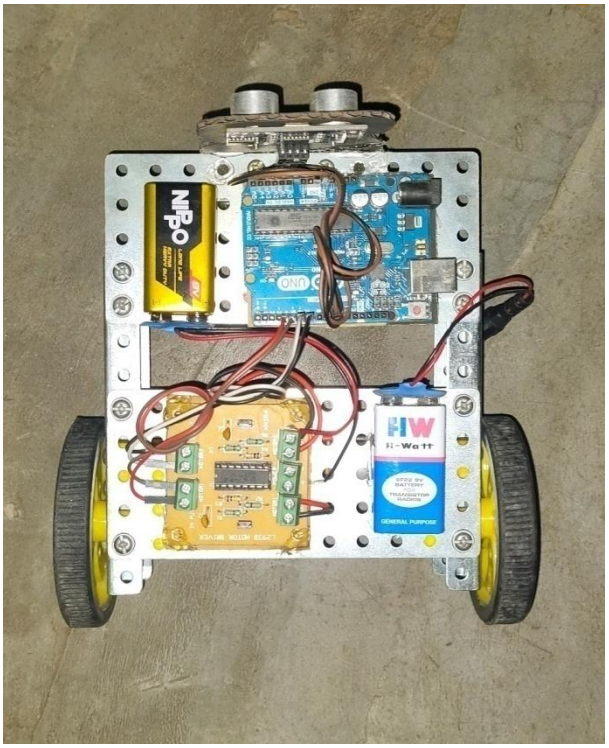
- Obstacle avoiding robots can be use for navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They can also be used in dangerous environments.

LIMITATIONS:

- It is not in human control.
- It is use for short diatance only.
- It cannot distinguish between small and large pieces of object.

OBSTACLE AVOIDING ROBOT





VIDEO: https://github.com/thevkrg/Obstacle-Avoiding-Robot